

Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of

Modification of Parts 2 and 15 of the
Commission's Rules for Unlicensed Devices
and Equipment Approval

ET Docket No. 03-201

COMMENTS OF SIRIUS SATELLITE RADIO INC.

Sirius Satellite Radio Inc. ("Sirius") hereby comments on the Federal Communications Commission's ("FCC" or "Commission") *Notice of Proposed Rulemaking* released September 17, 2003 in the above-captioned proceeding.¹

I. INTRODUCTION AND SUMMARY

In its *Notice of Proposed Rulemaking*, the Commission proposes, *inter alia*, to amend Part 15 of its rules to: (1) permit the use of advanced antenna technologies, including phased array and sectorized antennas, in the 2.4 GHz band; and (2) permit the use of standard connectors on unlicensed devices.² Sirius supports the Commission's proposal to provide users and manufacturers of unlicensed technology with greater flexibility. Sirius, which uses sectorized antennas in its own terrestrial repeater network, supports the Commission's efforts to facilitate development and deployment of advanced antenna technologies. Sirius, however, remains concerned that grant of too much flexibility will result in significant interference to licensees operating in adjacent bands, including Sirius, which is licensed to provide satellite Digital Audio

¹ *Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval*, Notice of Proposed Rulemaking, FCC 03-223, ET Docket No. 03-201 (Sept. 17, 2003) ("*Notice of Proposed Rulemaking*").

² *Notice of Proposed Rulemaking* at ¶ 1.

Radio Service (“satellite DARS”) in the 2320.0 MHz to 2332.5 MHz band. Consequently, Sirius proposes stringent testing of sectorized and phased array antenna systems and continued use of unique connectors in certain limited circumstances. For the same reasons, Sirius requests that the Commission establish a new limit for out-of-band emissions by Part 15 equipment (measured over the satellite DARS band) and clarify that RF lighting is not permitted as an ISM device in the 2.4 GHz band. These measures will strike an appropriate balance between providing sufficient protection to licensees in adjacent bands and promoting innovation by unlicensed users.

II. THE USE OF ADVANCED ANTENNA TECHNOLOGIES WILL INCREASE SPECTRAL EFFICIENCY WITHOUT CAUSING INTERFERENCE, PROVIDED THE CERTIFICATION PROCESS IMPLEMENTED BY THE COMMISSION IS ADEQUATE.

Sirius, which itself uses sectorized antennas in its terrestrial repeater operations, supports the Commission’s proposal to permit use of efficiently configured sectorized and phased array antenna technologies in the 2.4 GHz band. As the Commission noted, these antenna technologies increase spectral efficiency “by making it possible to re-use a given frequency to communicate with different devices along non-overlapping paths.”³ Use of these antenna technologies is limited by the fact that the Commission currently authorizes phased array systems on a case-by-case basis and, to date, “has not generally authorized the operation of sectorized antennas by spread spectrum systems.”⁴ However, the Commission has proposed to amend Part 15 to accommodate these technologies. Sirius supports this proposal because it will decrease administrative burdens and provide greater regulatory certainty for equipment

³ *Id.* at ¶¶ 5, 8.

⁴ *Id.* at ¶ 10.

manufacturers and operators of these devices. This, in turn, will promote continued investment in and deployment of these innovative technologies.

At the same time, Sirius cautions that the certification process for these antenna systems must ensure that such systems do not create harmful interference to licensed users of adjacent frequency bands. Specifically, the proposed certification rules should, therefore, take into account beam overlap and the presence of multiple antennas.⁵ To this end, the Commission should revise its proposed certification rules to require testing of all sectors or phases to ensure that any resulting beam overlap does not cause harmful interference. In addition, the Commission must “modify the compliance testing requirements for systems that employ multiple antennas or radiating elements”⁶ because the presence of multiple antennas could cause increased interference depending on how the antennas are placed. Consequently, if an operator intends to use two or more sectorized or phased array antennas at the same location, all possible placements that could be used by an operator must be tested. Inclusion of these factors (*i.e.*, beam overlap and the use of multiple antennas) will ensure that the certification process better models actual deployment conditions and, therefore, more accurately indicates the true levels of harmful interference that advanced antenna systems will produce once deployed.

III. AUTHORIZING STANDARD CONNECTORS WILL PROVIDE OPERATORS SUFFICIENT FLEXIBILITY NEEDED TO MEET INDIVIDUALIZED NEEDS.

Sirius generally supports the Commission’s proposal to permit use of standard connectors for antennas. Sirius agrees that, where testing has already been performed on the highest gain antenna that can be used with a particular transmitter at the maximum output power of that transmitter, there needs be no retesting of any antenna of a similar type that does not exceed the

⁵ *Id.* at ¶¶ 13, 15.

⁶ *Id.* at ¶ 15.

antenna gain of the tested antenna. This approach eliminates unnecessary administrative burdens and provides operators with sufficient flexibility to address individualized needs.

In particular, Sirius concurs with the FCC's apprehension surrounding extending a standard connectors policy to spread spectrum systems employing frequency hopping technology. Although the Commission proposed "to allow marketing of separate radio frequency power amplifiers on a limited basis,"⁷ the agency itself questioned "whether the unique connector requirement may be necessary to ensure that 1 Watt amplifiers are not used with devices that are limited to 125 mW."⁸

As the Commission is aware, 1 Watt amplifiers are small and simple, cheap and convenient. Connecting such amplifiers to otherwise lawful Part 15 or 18 devices could dramatically increase a device's range or effectiveness, but at the cost of harmful interference to co-channel or adjacent-channel licensees. These facts, combined with the history of similar problems (early Citizens Band radio, for example), suggest some caution is warranted. Thus, to help prevent and/or minimize interference, the Commission should retain the unique connector requirement, applied only to frequency hopping systems.

IV. LIMITS ON OUT OF BAND EMISSIONS FROM PART 15 USERS ARE ESSENTIAL TO ENSURE THE CONTINUED OPERATION OF LICENSED USERS IN ADJACENT BANDS.

Sirius urges the Commission to take this opportunity to ensure that out-of-band emissions from Part 15 or Part 18 devices do not cause interference with licensed users of adjacent bands.

⁷ *Id.* at ¶ 20.

⁸ *Id.* The *Spread Spectrum First Report and Order* amended Section 15.247(b)(1) to provide, "For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels, all frequency hopping systems in the 5725-5850 MHz band, and all direct sequence systems: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts." See *Amendment of Part 15 of the Commission's Rules Regarding Spread Spectrum Devices*, First Report and Order, 15 FCC Rcd 16244 (2000) ("*Spread Spectrum First Report and Order*"); 47 C.F.R. § 15.247(b)(1).

Equipment marketed under Parts 15 and 18 is *not* licensed and thus is by definition secondary to licensed services such as satellite DARS.⁹ This is particularly true for out-of-band emissions, which by definition are also secondary.¹⁰

Moreover, satellite DARS is uniquely susceptible to out-of-band emissions from Part 15 users.¹¹ Satellite DARS signals are sent to very small aperture low gain antennas which generally are in motion. Thus, the received downlink signal power is so low that satellite DARS receivers operate near the noise floor, with a link margin just sufficient to protect against outages from blockage, multi-path fading, and foliage attenuation. Moreover, the mobility of the service places satellite DARS receivers in close proximity to interference creating Part 15 devices. Sirius' experience with out-of-band emissions from RF lighting devices operating in the 2.4 GHz band, described more fully below, shows that even small amounts of out-of-band emissions from nearby devices can create large "kill zones" in which satellite reception is impossible.

While Sirius supports the development of innovative technologies, the Commission must ensure that such technologies do not impair licensed spectrum usage in other bands. Satellite DARS customers, who pay for high-quality digital audio entertainment, will not accept intermittent interference caused by these kill zones. As the Commission previously noted, if satellite radio "is subject to excessive interference, the service will not be successful and the American public will not benefit from the service."¹² Sirius previously has demonstrated that, to

⁹ 47 C.F.R. §§ 15.5, 18.111.

¹⁰ 47 C.F.R. § 2.1(c).

¹¹ See *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Reply Comments of XM Radio Inc. and Sirius Satellite Radio Inc., ET Docket No. 98-153 (filed Aug. 20, 2003) ("*Ultra-Wideband Reply Comments*").

¹² *Amendment of the Commission's Rules to Establish Part 27, the Wireless Communications Service*, Memorandum Opinion and Order, 12 FCC Rcd 3977, ¶ 27 (1997).

protect satellite radio reception, aggregate emissions from unlicensed devices should be no higher than 8.6 uV/meter at 3 meters for free space, co-polarized condition, as measured in a 1 MHz bandwidth at the edge of the DARS band.¹³ This is described more fully in Appendix 1. As can be seen in the Figure of Appendix 1, Part 15 out-of-band emissions complying to the 500 uV/meter limit are many times the level of the received satellite signal. An 8.6 uV/meter out-of-band interference signal limit at 3 meters for Part 15 devices is technologically feasible, because it is out-of-band with a frequency separation of about 100 MHz. Thus, to ensure that satellite radio and other licensed users in adjacent bands can continue to provide their own innovative services to the American public, Sirius urges the Commission to take this opportunity to adopt this Part 15 out-of-band interference limit in the satellite DARS band.

V. THE COMMISSION SHOULD CLARIFY THAT RF LIGHTING DEVICES ARE NOT PERMITTED IN THE 2.4 GHZ BAND.

Sirius urges the Commission to clarify in this proceeding that RF lighting devices are not permitted in the 2.4 GHz band. On May 30, 2003, the Commission terminated its proceeding to amend Part 18 to accommodate RF lighting devices operating in the 2.4 GHz band because the only party interested in marketing RF lighting devices for the 2.4 GHz band decided to discontinue development of the service.¹⁴ In doing so, however, the Commission did not address whether RF lighting devices may be operated in the 2.4 GHz band at present or in the future, possibly though a misreading of the out-of-band emissions limit applicable to “miscellaneous”

¹³ See *Multispectral Solutions, Inc.*, Sirius Satellite Radio Inc., XM Radio Inc. joint *ex parte* letter, at 3, ET Docket 98-153 (filed Feb. 7, 2002); see also Comments of XM Radio Inc., ET Docket 98-153, at 1 (filed Sept. 12, 2000); Reply Comments of XM Radio Inc. at 2, ET Docket 98-153 (filed May 10, 2001); Reply Comments of Sirius Satellite Radio Inc. at 1, ET Docket 01-278 (filed March 12, 2002). See also Air Transport Association of America et al, joint *ex parte* letter, at 4 (filed Nov. 15, 2001) (proposing a comparable out of band UWB emission limit of –160dBW/MHz peak at 3 meters, below 6 GHz).

¹⁴ See *1998 Biennial Review – Amendment of Part 18 of the Commission’s Rules to Update Regulations for RF Lighting Devices*, Order, ET Docket No. 98-42, FCC 03-123 (2003).

ISM devices.¹⁵ Sirius previously has urged the agency to remove any remaining ambiguity and it renews that request here.¹⁶

Historically, the Commission has been “particularly concerned” that out-of band emissions from RF lighting devices operating in the 2.4 GHz band “could cause interference to other services operating near the 2450 MHz band, such as satellite DARS operating in the 2320-2345 MHz frequency band.”¹⁷ Tests conducted using installed RF lighting and satellite DARS receivers clearly established that RF lighting devices are incompatible with satellite DARS.¹⁸ In fact, as a minimum, the out-of-band emissions from the RF lighting devices would create a 50 meter kill zone around each light, in which satellite reception would not be possible.¹⁹

Prior to the commencement of the 1998 rulemaking, the Code of Federal Regulations contained neither express authority, nor standards, specific to RF lighting in the 2.4 GHz-2.5 GHz band.²⁰ The same is true today. The FCC terminated the RF lighting proceeding before it

¹⁵ The “miscellaneous” power limit, 47 C.F.R. § 18.305(b), is not a “safe harbor” for RF lighting devices. Part 18 devices are secondary and may not cause harmful interference to licensed services. 47 C.F.R. § 18.111(b) (2000) (“irrespective of whether the equipment otherwise complies with the rules in this part, the operator of ISM equipment that causes harmful interference to any authorized radio service shall promptly take whatever steps may be necessary to eliminate the interference.”). *See also* 47 C.F.R. § 18.115(a). This is particularly true since much of the interference to satellite DARS receivers would derive from out-of-band energy. *See supra* note 10.

¹⁶ *See 1998 Biennial Review – Amendment of Part 18 of the Commission’s Rules to Update Regulations for RF Lighting Devices*, Sirius Satellite Radio Inc. and XM Radio Inc., Joint Petition for Clarification, ET Docket No. 98-42 (filed July 23, 2003) (“*RF Lighting Recon Petition*”).

¹⁷ *1998 Biennial Regulatory Review - Amendment of Part 18 of the Commission’s Rules to Update Regulations for RF Lighting Devices*, Notice of Proposed Rulemaking, 13 FCC Rcd 11307, ET Docket No. 98-42, FCC 98-53 (April 9, 1998) (“*RF Lighting NPRM*”), at ¶ 12.

¹⁸ *See RF Lighting Recon Petition* at 5.

¹⁹ *See id.* at 6.

²⁰ In 1985, the Commission classified RF lighting devices as Part 18 ISM equipment. In the *RF Lighting NPRM*, however, the Commission proposed specific out-of-band emission limits only for RF lighting devices below 1 GHz. *RF Lighting NPRM*, at ¶ 12; 47 C.F.R. § 18.305(c).

adopted rules for RF lighting devices in the 2.4 GHz-2.5 GHz band because there is no apparent manufacturing interest in utilizing the band for RF lighting. Moreover, the 2.4 GHz band already is crowded with unlicensed devices, especially for products relatively new to the market (*e.g.*, Bluetooth, Wi-Fi) and thus certain to become more crowded. And, as the tests proved, it is economically impractical to manufacture 2.4 GHz RF lighting containing out-of-band emission suppression sufficient to protect satellite radio transmissions.

Sirius does not, of course, oppose RF lighting. Indeed, Sirius supported recent FCC rules establishing technical standards for RF lighting in spectrum outside of S-band.²¹ So, RF lighting already has access to spectrum, and a growing number of customers. The same is true for satellite DARS—without unavoidable and debilitating interference from broadband RF lighting. Accordingly, in order to promote settled expectations of co-frequency and adjacent channel licensees and users, the Commission should clarify that RF lighting devices are not permitted in the 2.4 GHz band.

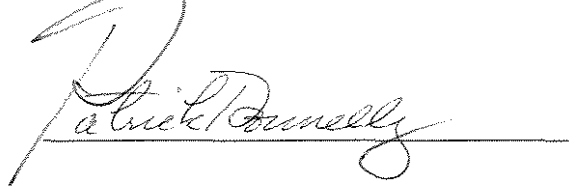
VI. CONCLUSION

Sirius supports the Commission's efforts to amend its rules to promote better innovative technologies in the 2.4 GHz band by providing users and manufacturers of unlicensed technology with greater flexibility. In adopting these changes, however, the Commission must remain mindful of the need to protect licensed users of adjacent bands from harmful interference caused by spurious, and unnecessary, emissions. Thus, Sirius supports the Commission's

²¹ *See supra* note 14.

proposed amendments to Part 15 of its rules, with the alterations and clarifications detailed above.

Respectfully submitted,

A handwritten signature in cursive script, reading "Patrick Donnelly", is written over a horizontal line.

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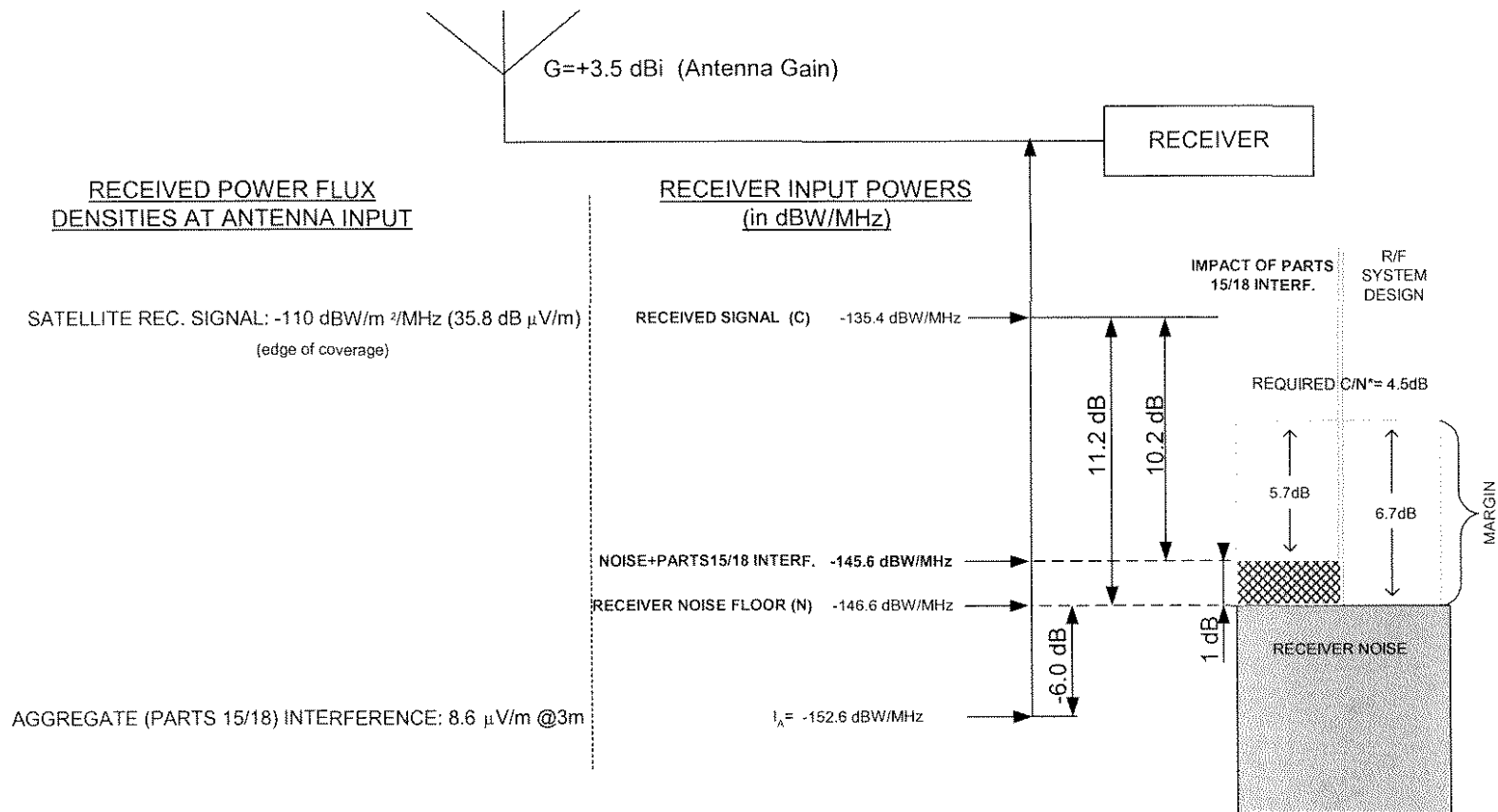
APPENDIX 1

The satellite DARS operators have previously demonstrated that, to protect satellite radio reception, the aggregate out-of-band interference from unlicensed Part 15/18 devices should not exceed an emission level of $8.6 \mu\text{V}/\text{meter}$ at 3 meters. The relationship of this emission level to the satellite radio transmission characteristics is illustrated in the attached Figure.

A review of the out-of-band limits specified for the various Part 15/18 unlicensed services that can operate within the band 2400 to 2483.5 MHz shows that potentially significant interference could be suffered by satellite DARS systems already operating in the 2320 to 2345 MHz band, unless specific attention is taken to protect these systems. As an example, in Part 15 devices for "Intentional Radiators" a general limit is specified for emission frequencies above 960 MHz of $500 \mu\text{V}/\text{meter}$ at 3 meters (§15.209). Some emission types have specific out-of-band limits identified (e.g., Field Disturbance Sensors (§15.245) and Frequency Hopping and Digitally Modulated Carriers (§15.247), etc.), but, depending on their actual emission level, they have a choice of meeting the lesser of the identified limit or the §15.209 limit.

In the case of UWB services the in-band emission level is specified as an e.i.r.p. level of -41.3 dBm/MHz or -51.3 dBm/MHz, but these levels are equal to or 10 db less than the $500 \mu\text{V}/\text{meter}$ limit at 3 meters, respectively.

In the case of Part 18 emissions, the field strength limits identified in §18.305 range from 25 to $10 \mu\text{V}/\text{meter}$ at distances from 1600 to 30 meters, with specific formulas for increases above 500W.



- * C/N required for BER of 1×10^{-6} or better=4.5dB
 Typical Receive C/N=11.2dB
 System Margin for Propagation, etc.=6.7dB